Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

WHAT IS CLAIMED:

Claim 1. (currently amended) A wavelength converter comprising:

an optical/electrical signal converter for converting an input optical signal~~s~~ into an electrical digital signal~~s~~;

a clock generation unit connected to said optical/electrical ~~signed~~ signal converter and receiving reference clock signals each having a predetermined frequency indicating a transmission mode for automatically identifying one of at least two predetermined signal transmission modes for ~~said~~ the electrical digital signal~~s~~ and generating a phase-synchronized clock signal~~s~~ with ~~a specified~~the corresponding frequency that matches the identified signal transmission mode based upon one of the reference clock signals;

a timing regeneration circuit connected to said clock generation unit for regenerating a clock timing for ~~said~~ the electrical digital signal~~s~~ based upon the phase-synchronized clock signal~~s~~ that ~~are~~ is generated from said clock generation unit; ~~and~~

an electrical/optical converter connected to said timing regeneration circuit for converting the electrical digital signal~~s~~ that ~~are~~ is outputted from said timing regeneration circuit into an optical signal~~s~~ with a specified wavelength for wavelength-division multiplexed transmission~~.~~; and

a controller connected to said clock generation unit for controlling said clock generation unit for selecting the one the reference clock signals that corresponds to the identified signal transmission mode.

Claim 2. (cancel)

Claim 3. (currently amended) A wavelength converter comprising:

an optical/electrical signal converter that converts input optical signals into electrical digital signals;

a phase-synchronized oscillator circuit storing a few reference clocks each corresponding to a signal transmission mode of the electrical digital signals for generating ~~clock signals each~~a clock signal having an output clock frequency according to a transmission mode~~,~~ of the electrical digital signal based upon one of the reference clocks and clock timing of the electrical digital signal from said optical/electrical signal converter, said phase-synchronized oscillator being phase-controlled according to ~~said~~ the electrical digital signals~~.~~;

a timing regeneration circuit connected to said phase-synchronized oscillator for regenerating a clock timing signal for ~~said~~ the electrical digital signals based upon the clock signal~~s~~ that ~~are~~ is generated from said phase-synchronized oscillator circuit;

an electrical/optical converter connected to said timing regeneration circuit for converting the electrical digital signals that are outputted from said timing regeneration circuit into optical signals of a specified wavelength; and

an auto-clock controller connected to said phase-synchronized oscillator circuit for controlling the clock signal of said phase-synchronized oscillator circuit in selecting one of the reference clocks that corresponds to a transmission mode of the electrical digital signal which has been converted by said optical/electrical signal converter based upon a comparison between ~~a reference clock corresponding to a signal transmission mode of the electrical digital signals~~the reference clocks and the clock signals generated from said phase-synchronized oscillator circuit.

Claim 4. (cancel)

Claim 5. (original) The wavelength converter according to claim 4 further comprising:

means for generating a plurality of reference clock signals of predetermined frequencies according to the signal transmission mode; and

means for detecting a matched pair of one of said reference clock signals and said clock signal to generate a match detection signal,

wherein said auto-clock controller locks the output clock frequency of said phase-synchronized oscillator circuit according to the match detection signal from said detection means.

Claim 6. (cancel)

Claim 7. (cancel)

Claim 8. (currently amended) An optical communication apparatus comprising:

a first clock generation circuit receiving reference clock signals each having a predetermined frequency indicating a transmission mode of a transmission digital signal for automatically identifying ~~a~~ the transmission mode for the transmission digital signal~~s~~ and for generating a phase-synchronized clock signal~~s~~ with a specified frequency ~~that matches the signal transmission mode~~based upon one of the reference clock signals;

a first timing regeneration circuit connected to said first clock generation circuit for regenerating clock timing for the transmission digital signal~~s~~ based upon the phase-synchronized clock signals from said first clock generation circuit;

a first electrical/optical converter connected to said first timing regeneration circuit for converting the transmission digital signal~~s~~ from said first timing regeneration circuit into first optical signals at a specified wavelength, said first electrical/optical converter transmitting the optical signals to an optical network node;

a first optical/electrical converter connected to the optical network node for converting the optical signals at a specified wavelength that are received from ~~an~~ said optical network node into electrical, received digital signals;

a second clock generation circuit connected to said first optical/electrical converter receiving the reference clock signals for automatically identifying the transmission mode for the electrical digital signals from said optical/electrical signal converter and for generating a second phase-synchronized clock signal at ~~a~~ the specified frequency that matches the signal transmission mode of the electrical received digital signal~~s~~ based upon one of the reference clock signals; ~~and~~

a second timing regeneration circuit connected to said second clock generation circuit for regenerating the clock timing for the electrical received digital signals based upon the second phase-synchronized clock signal~~s~~ from said second clock generation circuit~~.~~; and

a controller connected to said first clock generation unit and said second clock generation unit for controlling said first clock generation unit for selecting the one of the reference clock signals that corresponds to the identified signal transmission mode of the transmission digital signal and for controlling said second clock generation unit for selecting the reference clock signal that corresponds to the identified signal transmission mode of the received electrical digital signal.

Claim 9. (currently amended) The optical communication apparatus according to claim 8 further comprising:

client equipment connected to said second timing regeneration circuit;

a second optical/electrical signal converter connected to said client equipment for converting the transmission optical signals received from said client equipment into the transmission digital signals; and

a second electrical/optical converter connected to said second timing regeneration circuit for converting the electrical received digital signals from said second timing regeneration circuit into second optical signals and for transmitting the second optical signals to the client equipment.

Claim 10. (currently amended) A wavelength division-multiplexing optical communication apparatus comprising:

transponders each further comprising:

a clock generation circuit receiving reference clock signals each having a predetermined frequency according to a transmission mode of a transmission digital signal for automatically identifying one of at least two predetermined signal transmission modes for the transmission digital signal~~s~~ and for generating a phase-synchronized clock signal~~s~~ with a specified frequency ~~that matches the identified signal transmission mode~~based upon one of the reference clock signals;

a timing regeneration circuit for regenerating clock timing of the transmission digital signal~~s~~ based upon the phase-synchronized clock signal~~s~~ from said clock generation circuit;

an electrical/optical converter connected to said timing regeneration circuit for converting the transmission digital signal~~s~~ from said timing regeneration circuit into an optical signal~~s~~ at a specified wavelength; ~~and~~

a controller connected to said clock generation circuit for controlling said clock generation unit for selecting the one of the reference clock signals that corresponds to a transmission mode of the transmission digital signal; and

a wavelength division-multiplexing optical transmission equipment connected to said electrical/optical converter of said transponders for wavelength-multiplexing the optical signals from said electrical/optical converter with optical signals at other wavelengths and for transmitting the optical signals to an optical network.

Claim 11. (currently amended) A wavelength division-multiplexing optical communication apparatus comprising:

a wavelength separator for separating a first optical signal~~s~~ of a specified wavelength from wavelength-multiplexed optical signals that are received from an optical network;

an optical/electrical signal converter connected to said wavelength separator for converting the first optical signal~~s~~ of a specified wavelength received from said wavelength separator into an electrical digital signal~~s~~;

a clock generator circuit connected to said optical/electrical signal ~~convertor~~converter receiving reference clock signals each having a predetermined frequency according to a transmission mode of a an electrical digital signal automatically identifying one of at least two predetermined signal transmission modes for the electrical digital signal~~s~~ from said optical/electrical signal converter and for generating a phase-synchronized clock signal~~s~~ with a specified frequency based upon one of the reference clock signals and clock timing of the electrical digital signal from said optical/electrical signal converter; ~~of a specified wavelength that matches the identified signal transmission mode;~~

a timing regeneration circuit connected to said clock generator circuit for regenerating clock timing for ~~said~~ the electrical digital signal~~s~~ based upon the phase-synchronized clock signal~~s~~ from said clock generator circuit; ~~and~~

an electrical/optical converter connected to said timing regeneration circuit for converting the electrical digital signal~~s~~ from said timing regeneration circuit into a second optical signal~~s~~ of a specified wavelength~~.~~; and

a controller connected to said clock generator circuit for controlling said clock generation unit for selecting the one of the reference clock signals that corresponds to a transmission mode of the electrical digital signal converted by said optical/electric converter.

Claim 12. (new) The wavelength converter according to claim 1, further comprising:

oscillators connected to said clock generation unit for each generating one of the reference clock signals.

Claim 13. (new) The wavelength converter according to claim 8, further comprising:

oscillators connected to said clock generation unit for each generating one of the reference clock signals.

Claim 14. (new) The wavelength converter according to claim 10, further comprising:

oscillators connected to said clock generation unit for each generating one of the reference clock signals.

Claim 15. (new) The wavelength according to claim 11, further comprising:

oscillators connected to said clock generation unit for each generating one of the reference clock signals.

Claim 16. (new) A wavelength converter comprising:

an optical/electrical signal converter for converting input optical signals into electric digital signals;

a clock generation unit connected to said optical/electrical signal converter for automatically identifying one of at least two predetermined signal transmission modes for the electrical digital signals and generating phase-synchronized clock signals with a specified frequency that matches the identified signal transmission mode;

a timing regeneration circuit connected to said clock generation unit for regenerating a clock timing for the electrical digital signals based upon the phase-synchronized clock signals that are generated from said clock regeneration unit;

an electrical/optical converter connected to said timing regeneration circuit for converting the electrical digital signals that are outputted from said timing regeneration circuit into optical signals with a specified wavelength for wavelength-division multiplexed transmission, wherein said clock generation unit further comprises:

an oscillator for generating predetermined phase-controlled clock signals for the electrical digital signals;

a frequency divider for dividing the phase-controlled clock signals from said oscillator to generate an output clock frequency; and

an auto-clock controller connected to said frequency divider for changing and controlling a division ratio for said frequency divider so that the auto-clock controller locks the division ratio of said frequency divider when the output clock frequency of said frequency divider indicates a specific match with a reference clock frequency that depends on the transmission mode for said electrical digital signals.

Claim 17. (new) A wavelength converter comprising:

an optical/electrical signal converter that converts input optical signals into electrical digital signals;

a phase-synchronized oscillator circuit for generating clock signals each having an output clock frequency according to a transmission mode, said phase-synchronized oscillator being phase-controlled according to the electrical digital signals;

a timing regeneration circuit connected to said phase-synchronized oscillator for regenerating a clock timing signal for the electrical digital signals based upon the clock signals that are generated from said phase-synchronized oscillator circuit;

an electrical/optical converter connected to said timing regeneration circuit for converting the electrical digital signals that are outputted from said timing regeneration circuit into optical signals of a specified wavelength; and

an auto-clock controller connected to said phase-synchronized oscillator circuit for controlling the clock signal of said phase-synchronized oscillator circuit based upon a comparison between a reference clock corresponding to a signal transmission mode of the electrical digital signals and the clock signals, wherein said phase-synchronized oscillator circuit further comprises:

a voltage control oscillator;

a first frequency divider with a variable division ratio connected to said voltage control oscillator for dividing an output clock from said voltage control oscillator and outputs output clock signals from said phase-synchronized oscillator circuit; and

a phase frequency comparator connected to said first frequency divider for controlling said voltage control oscillator according to a comparison between the output clock signals from said first frequency divider and said electrical digital signals, whereby said auto-clock controller changes and controls the variable division ratio for said first frequency divider, and when the comparison between the reference clock and the output clock signal from said first frequency divider assumes a state, the auto-clock controller locks the division ratio for said first frequency divider.

Claim 18. (new) A wavelength converter comprising:

an optical/electrical signal converter that converts input optical signals into electrical digital signals;

a phase-synchronized oscillator circuit for generating clock signals each having an output clock frequency according to a transmission mode, said phase-synchronized oscillator being phase-controlled according to the electrical digital signals;

a timing regeneration circuit connected to said phase-synchronized oscillator for regenerating a clock timing signal for the electrical digital signals based upon the clock signals that are generated from said phase-synchronized oscillator circuit;

an electrical/optical converter connected to said timing regeneration circuit for converting the electrical digital signals that are outputted from said timing regeneration circuit into optical signals of a specified wavelength; and

an auto-clock controller connected to said phase-synchronized oscillator circuit for controlling the clock signal of said phase-synchronized oscillator circuit based upon a comparison between a reference clock corresponding to a signal transmission mode of the electrical digital signals and the clock signals, wherein said phase-synchronized oscillator circuit further comprises:

a plurality of oscillators of different oscillation frequencies for generating output clock signals signal transmission modes;

a frequency divider for dividing the output clock signal from one of said

oscillators selected by said auto-clock controller with a division ratio specified by said auto-clock controller; and

a detector detecting a matching state between the reference clock that is output from said frequency divider and said output clock signal, whereby said auto-clock controller locks the output clock frequency from said phase-synchronized oscillator circuit according to the match detection signal from said detector.

Claim 19. (new) A wavelength converter comprising:

an optical/electrical signal converter that converts input optical signals into electrical digital signals;

a phase-synchronized oscillator circuit for generating clock signals each having an output clock frequency according to a transmission mode, said phase-synchronized oscillator being phase-controlled according to the electrical digital signals;

a timing regeneration circuit connected to said phase-synchronized oscillator for regenerating a clock timing signal for the electrical digital signals based upon the clock signals that are generated from said phase-synchronized oscillator circuit;

an electrical/optical converter connected to said timing regeneration circuit for converting the electrical digital signals that are outputted from said timing regeneration circuit into optical signals of a specified wavelength; and

an auto-clock controller connected to said phase-synchronized oscillator circuit for controlling the clock signal of said phase-synchronized oscillator circuit based upon a comparison between a reference clock corresponding to a signal transmission mode of the electrical digital signals and the clock signals, wherein said phase-synchronized oscillator circuit further comprises:

an oscillator for generating fundamental clock signals;

a counter for counting said fundamental clock signals in a counting period that is proportional to a cycle of the clock signals from said phase-synchronized oscillator circuit; and

a comparison means for comparing the count value obtained by said

counter with a reference clock count that is pre-stored according to the signal transmission mode to generate a match detection signal;

whereby said auto-clock controller locks the output clock frequency in said phase-synchronized oscillator circuit according to the match detection signal from said comparison means.